

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VI (New) EXAMINATION – WINTER 2019****Subject Code: 2160602****Date: 06/12/2019****Subject Name: Applied Fluid Mechanics****Time: 02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Define: (i) Critical depth (ii) Total energy line (iii) Hydraulic gradient line **03**
 (b) Describe water hammer phenomenon in pipes. **04**
 (c) Derive the Hagen-Poiseuille equation for laminar flow in the circular pipe. **07**

- Q.2** (a) Define the most economical channel section. Derive the condition for rectangular channel of best section **03**
 (b) Differentiate hydro-dynamically smooth and rough pipes. **04**
 (c) A horizontal pipe of diameter 450 mm is suddenly contracted to diameter of 250 mm. The pressure intensity in larger and smaller pipes are given as 14.5 N/cm^2 and 12.5 N/cm^2 . If $C_c = 0.62$ find loss of head due to sudden contraction and discharge of water **07**

OR

- (c) Prove that Maximum Velocity is equal to one and half times the average velocity for flow between fixed parallel plate. **07**
- Q.3** (a) Define and enlist types of draft tube with neat sketch **03**
 (b) What do you mean by pipes in series and pipes in parallel? How the loss of head is determined in both systems. **04**
 (c) Explain boundary layer growth over a flat plate. Derive the expression for momentum thickness of boundary layer flow. **07**

OR

- Q.3** (a) Write a note on prandtl mixing length theory **03**
 (b) Write a note on prevention of boundary layer separation **04**
 (c) Explain boundary layer theory and derive Karman's momentum equation for boundary layer. **07**
- Q.4** (a) Differentiate between back water curve and drop down curve. **03**
 (b) Derive Chezy's formula to calculate the velocity in case of a channel. **04**
 (c) A 6 meter wide channel conveys water at a depth of 2.15 m. The bed slope of channel is 0.001. Find the width to be provided in transition so as to obtain critical depth. Alternatively with the same width of 6m, find the rise in the bed level required to produce critical flow in channel. Take $N = 0.018$ **07**

OR

- Q.4** (a) Define specific speed, unit discharge and unit power of turbine. **03**
 (b) Draw Specific energy curve and explain the terms, Critical depth, alternate depths, sub critical and super critical flow **04**
 (c) Describe direct step method of calculating the length of back water curve, also discuss the need for calculating the length of back water curve. **07**

- Q.5** (a) Differentiate between a pump and the turbine. **03**
(b) What are distorted and undistorted models? What are the advantages of using distorted model? **04**
(c) What is dimensional less number? State and explain them. **07**

OR

- Q.5** (a) Differentiate between Impulse and Reaction turbine. **03**
(b) Two jet strikes the bucket of Pelton wheel which is having shaft power of 16000 kW, the diameter of each jet is given as 200 mm. If the net head on the turbine is 200 m. Find the overall efficiency of a turbine. Take $C_v=1$ **04**
(c) State and explain Buckingham's π theorem. Why it is considered over Rayleigh method over dimensional analysis. **07**
